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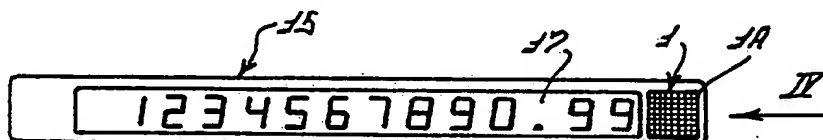
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**A compact electronic calculator.**

The invention relates to a compact electronic calculator to be worn as a pocket or wrist calculator or as a necklace. It is provided with a screen and at least one operating device to be actuated by human voice. The calculator operates by voice recognition.



**Fig. 2**

**EP 0 212 759 A1**

## A COMPACT ELECTRONIC CALCULATOR

The invention relates to a compact electronic calculator such as a pocket or wrist calculator, provided with a screen, electronic circuits and one or more operating devices.

The known calculators are provided with a keyboard, through which the calculator can be operated.

Such known calculators, no matter how compact their construction is, will be relatively bulky due to the presence of the keyboard. Further the known calculators need experienced operators who can easily operate the keyboard.

The object of the invention is to improve the well known calculators and to provide a small and compact electronic calculator, which can be operated very easily.

According to the invention, the calculator is provided with at least one operating device to be actuated by human voice, through which digits, such as ciphers, can be produced on the screen.

If the calculator comprises a microphone designed in such a way that mainly sound coming from a certain direction will be received, the operation of the calculator can be improved.

If the calculator can be operated by voice recognition and comprises exchangeable programs for certain languages, the calculator can easily be used in various languages.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings.

Figure 1 comprises an example of a diagram of circuits in broad outline;

Figure 2 is a plan view of a calculator in accordance with the invention;

Figure 3 is a side elevation of said calculator according to the arrow III in Figure 2;

Figure 4 is a side elevation according to the arrow IV in Figure 2;

Figure 5 is a bottom view according to the arrow V in Figure 4;

Figure 6 is a side elevation of the device, provided with a cap;

Figure 7 is a plan view of a wrist calculator;

Figure 8 is a side elevation according to the arrow VIII in Figure 7 and

Figure 9 is a bottom view according to the arrow IX in Figure 8.

Figure 10 is a plan view of a second embodiment of a calculator according to the invention;

Figure 11 is a side elevation of the device according to the arrow XI in Figure 10;

Figure 12 is a view according to the arrow XII in Figure 11;

Figure 13 is a block diagram of the embodiment according to the Figures 10-12.

An example of a circuit that may be used in the electronic device according to the invention, in this case a calculator, is shown in Figure 1. The analogous signal, produced by a microphone 1, is connected with a speech analyzer 5 which, together with other elements of the device constitutes a voice recognizer reacting to specific words uttered by persons.

The speech analyzer 5 is constructed in such a way that the signal, produced by the microphone 1 and representing a certain operation command - (e.g. "one", "three", "nine", "zero", "add", "multiply", "root", etc.), is converted into digital pulses. These pulses e.g. couched as a number of digitals representing the acoustic signal can be transmitted to a comparator 11 through a connection 12. The speech analyzer 5 is, preferably and according to the embodiment explained, selective as to words uttered by different persons, but non-selective or less selective as to the pitch of the spoken words.

The comparator 11 is connected with a memory 8 by means of a bus 10. In the memory locations of said memory 8 a number of groups of digital words may be stored, with each group corresponding with a word, registered by a program and present in a digital shape, said word representing one of the operation commands mentioned. An acoustic signal, uttered by the speaker during operation of the device, is fed into the voice and/or speech analyzer 5 via the input 3. The resulting digital word is conveyed to the comparator 11 through the bus 12, which comparator compares the word with each of the operation commands, stored in a digital shape in the aforementioned groups of memory locations of the memory 8. The scanning of these memory locations is steered by a micro-processor 16 with instruction memory, complementing the comparator 11 and the memory 8. If the comparator establishes that a word, received through the connection 12 of the speech analyzer 5, corresponds with one of the words stored in the memory 8, the comparator issues to its output bus 13 a digital number which corresponds with the address of memory locations in which the relevant, recognized word occurs in the memory 8. This digital number may have a limited size, e.g. any of the numerals 0 through 9 for the numerical values to be put in, and some numeral operation commands, since the number of acoustically spoken commands in this embodiment, i.e. with a calculator, may be restricted to a small number of words. This digital number is compared,

e.g. through a range of simple comparators 14, with the operation commands (numeral and operation commands) that match the electronic control circuits incorporated into the circuit or systems with similar functions in a built-in processing device, in this case a calculator 15. In this way a pulse is conveyed to a respective one of these circuits, so that the uttered word is transmitted to the calculator.

The expressed word will then appear on the screen. The circuit of the calculator 15 itself may correspond with that of a usual calculator.

The device, shown in the Figures 2 to 6 is a calculator of oblong shape and is provided with a screen 17, mounted on one of the long sides of the device. Preferably, the screen has a length, sufficient for comprising 10 digits or more, so that the length of the device broadly matches that of a usual pen and, hence, can be easily carried in one's pocket. The device according to this embodiment has a length of approximately 10 cm, a width of approximately 1 cm and a thickness of approximately 0.5 cm. According to another aspect of the invention, the width of the device broadly corresponds with the height of the row of digits on the screen.

At the end of the screen 17 the microphone 1 is arranged, while a battery with cover 18 is arranged in the device near the other end of the screen. The circuits of the calculator are mounted behind the screen. Preferably, the microphone 1 has inputs on at least two sides of the device, in this case three openings; 1A, 1B, 1C (see Figures 2, 3 and 4).

On the side where the microphone is mounted a slide regulator 1E is provided, by means of which a built-in amplification of the acoustic signal may be adjusted; this feature makes it possible, on the one hand, to speak into the microphone at a distance of e.g. 3 cm from the microphone, inaudible for other persons. On the other hand, it is possible to speak, at an altered amplification, at a distance of e.g. 25 cm from the microphone, the screen being clearly readable at the same time.

As shown in Figure 6, the device may be provided with a cap 19 with clip 20, ensuring that the microphone is protected and that the device may be carried in the inside of a pocket. The calculator according to the invention offers the advantage of simplicity and compactness and of simplicity of control, since the risk of errors is smaller in case of spoken words in comparison with the use of a keyboard with small buttons.

It may be of advantage if the microphone is arranged at one end of the calculator, as in that case the calculator can be operated conveniently.

Preferably, the calculator has a length of approximately 10 cm, a width of approximately 1 cm and a thickness of approximately 0.5 cm (Fig. 2 through 4), while it is in transverse section about rectangular (Fig. 4).

It is of advantage if the calculator will be manufactured of synthetic material, and if the calculator will be provided with a switch 1F making it possible (by partly moving the switch) to illuminate the screen, so that the device can also be used when it is rather dark.

The Figures 7 and 8 comprise another embodiment of the invention. The relevant device comprises a bracelet 21, making it possible to wear the calculator on one's wrist, or as a necklace. Said calculator comprises a screen 22, a microphone 23, a battery 24, and a cover 25 on the rear side of the calculator. The battery 25 is mounted on the inside of the calculator. This calculator is capable of being operated in the same manner as the calculator described heretofore, while it also offers the advantages of easy use. If desired, an electronic watch may be incorporated into the device, simultaneously with the calculator, for both of which the screen 22 can be used. The diagram of circuits (Fig. 1) may remain substantially the same; the number of acoustic signals, required for a watch, may be smaller than that required for a calculator. If required, the watch may comprise an alarm and both setting of the watch and of the alarm may take place by means of spoken words.

A further embodiment of the calculator according to the invention is shown in the Figures 10 through 13. This embodiment has the characteristics described hereafter, whereas non-mentioned characteristics may be the same as those in the first embodiment.

The device according to the second embodiment comprises a so-called "conical" microphone 28, which substantially converts words into electrical signals, when these words are reaching the microphone from a certain direction.

A single, sound-absorbing opening 27 of the microphone is provided at the side of the calculator casing, in which the screen 17 is also arranged. Preferably, this opening 27 is situated directly next to the screen 17 and near an extremity of the oblong casing of the device. Through the application of the microphone 26 which is basically perceptive to sounds which reach the microphone, in the arrangement in question, in a direction which is perpendicular to the plane of the screen, it is possible to control the device acoustically in such a way that interfering noises coming from other directions are suppressed.

The words to be put into the memory 8, expressing e.g. numerical values as well as those which represent e.g. numeral operations, can be transmitted electronically into the memory. Carriers of such words, which may already have been changed into digital pulses, will be indicated as programs 28.

The programs 28 can be inserted into a slot 29 in the casing of the calculator (cf. block diagram according to Fig. 13).

Once all words of a program 28 have been transmitted into the memory, the calculator is ready for operation. The words uttered by the user, converted into digital words by the speech analyzer 5, are put into the comparator 11 through the bus 12, said comparator comparing each of these words with words, filed in the memory 8 by the program 28 (the program 28 being read by a program reading device 30), whereby the comparator is supported by the microprocessor 16, as in the first embodiment.

In this way the possibilities of the application of the device according to the second embodiment, in respect of the device according to the first embodiment can be considerably extended, since programs for a variety of different ranges of application can be inserted into the device, such as programs in the fields of finance, technics, administration and the like, but also programs which refer to several languages or programs which comprise e.g. words for numerical values and words for operations of numerals to be carried out (resp. words for other fields of application) in different languages. Examples are programs with the words "pi", "times", "minus", "square", "root", "percent", "is", resp. "dollar", "franc", resp. "triangle", "acceleration", "power", "mass", resp. "debit", "credit" in the English, German, French or another language.

It is also possible, however, that a device is destined for one objective only and that it is provided to that effect with a fixed program to meet the objective involved, e.g. calculations only; in that case the device may comprise a non-exchangeable memory 8. Provided within the casing of the device, manufactured of synthetic material and having the shape of a parallelepiped, is a supply battery 31 near the end of the casing, said battery being accessible via a removable cover 32 (Fig. 10 through 12). The slot 29 for inserting the programs is provided in the side plane which adjoins the plane in which the screen 17 is situated. During operation the slot 29 is situated on the top side of the device, while the program is situated behind the screen 17. The circuits, too, are provided mainly behind the screen 17. The casing of the device

has an oblong shape and has a diameter, embracing the smallest sizes, in a rectangular or square shape, e.g. 1 to 1 cm, with a largest size of approximately 10 cm.

When operating the calculator, the calculator may be switched on by saying e.g. "on". The voice recognition system will recognize this command and actuate the circuit in question. Furthermore, the device responds to the usual words that are necessary in order to be able to add, subtract, multiply, divide etc.

Manual control by means of key-board buttons is not necessary. The device is small and easy to operate. By means of different programs the device can be used in several languages. Furthermore, programs for various fields of application can be used, such as finance, technics etc. The device may also be definitely equipped in such a way that it is suitable only for one language or only for one kind of operation.

The invention is not restricted to the embodiments, described and shown heretofore, but may also be used in other, compact embodiments.

The embodiments shown should be considered as such and only serve as an explanation of the invention which should not be considered as being restricted to these embodiments.

## 30 Claims

1. A compact electronic calculator such as a pocket or wrist calculator, provided with a screen (17, 22), electronic circuits and one or more operating devices (1, 26), characterized in that the calculator comprises at least one operating device (1, 26) to be actuated by human voice, through which digits, such as ciphers, can be produced on the screen (17, 22).

2. A compact electronic calculator as claimed in claim 1, characterized in that the calculator is oblong and that it has a length, roughly corresponding with the largest size of the screen (17, 22) and a width which corresponds roughly with the height of a row of digits on the screen.

3. A compact electronic calculator as claimed in claim 1 or 2, characterized in that the calculator has a length of approximately 10 cm, a width of approximately 1 cm and a thickness of approximately 0.5 cm.

4. A compact electronic calculator as claimed in any one of the preceding claims, characterized in that the calculator comprises a microphone (26), designed in such a way that mainly sound coming from a certain side is received adequately.

5. A compact electronic calculator, provided with a screen (17, 22), electronic circuits and one or more operating devices for same, characterized

in that the calculator comprises a microphone (26), designed in such a way that mainly sound coming from a certain direction will be received adequately.

6. A compact electronic calculator as claimed in any one of the preceding claims, characterized in that the microphone (1, 26) is arranged on the pocket or wrist calculator on the same side as the screen (17, 22).

7. A compact electronic calculator as claimed in any one of the preceding claims, characterized in that the microphone (1) is provided with a regulator (1E) for adjusting the amplitude of the acoustic signals.

8. A compact electronic calculator as claimed in any one of the preceding claims, characterized in that the calculator comprises an electronic circuit with a voice recognizer (5, 11) and a memory (8), in such an arrangement that digits become visible on the screen (17, 22) through voice recognition.

9. A compact electronic calculator as claimed in any one of the preceding claims, characterized in that the calculator comprises a time indication and/or an alarm system and that the indication of time and/or alarm setting can be operated by human voice.

10. A compact electronic calculator as claimed in any one of the preceding claims, characterized in that the calculator can be operated by voice recognition and that the calculator comprises a program (28), exchangeable in a certain language.

11. A compact electronic calculator, provided with a screen, electronic circuits and one or more operating devices for same, characterized in that the calculator can be operated by voice recognition and that the calculator comprises exchangeable programs (28) for certain languages.

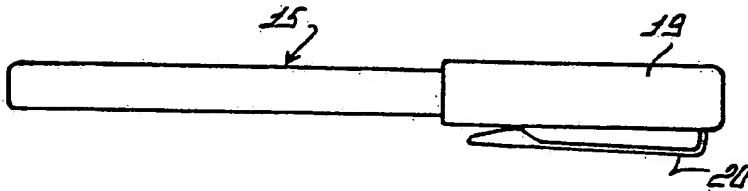
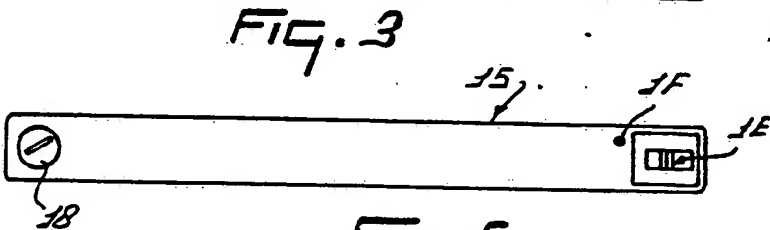
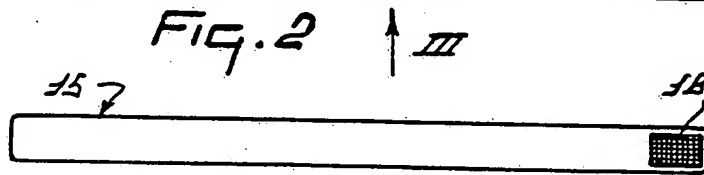
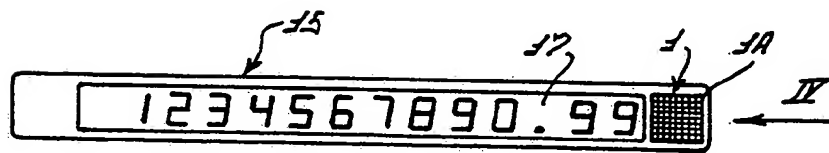
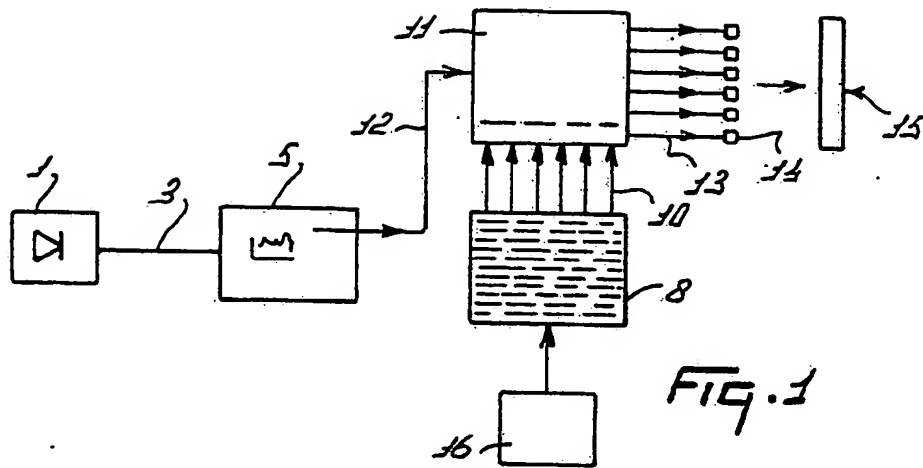
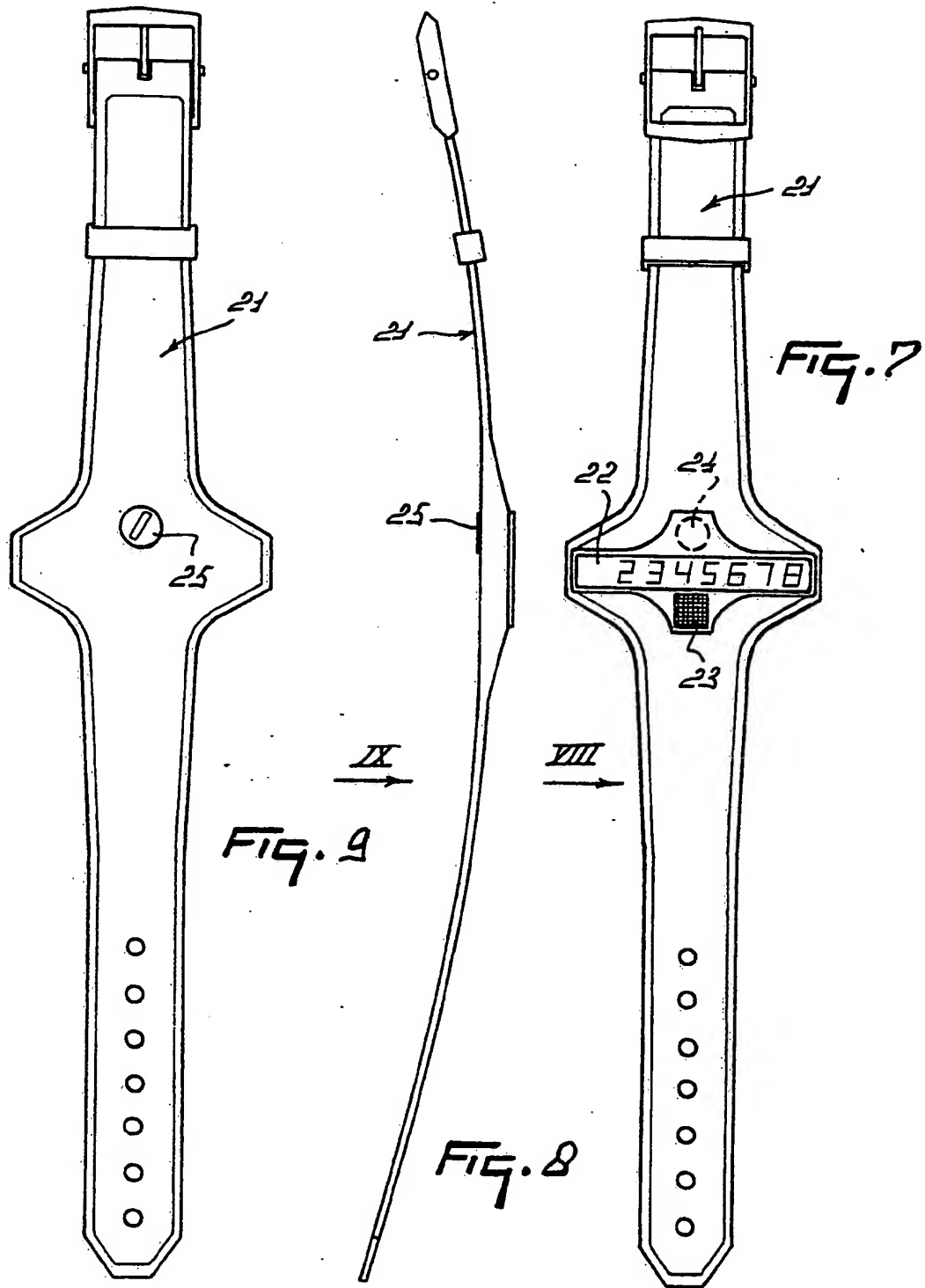
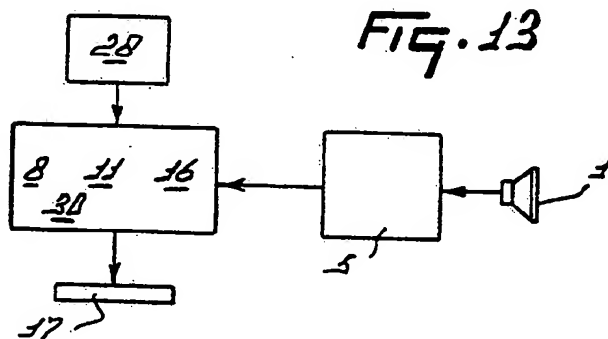
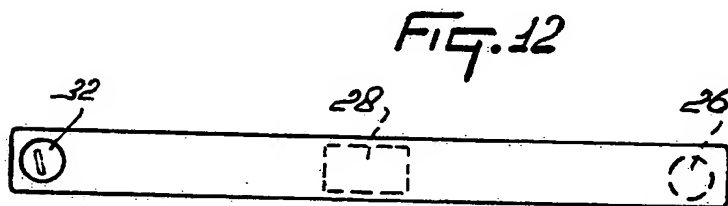
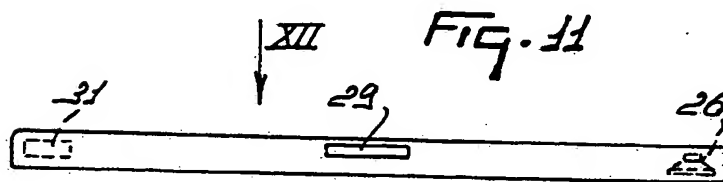
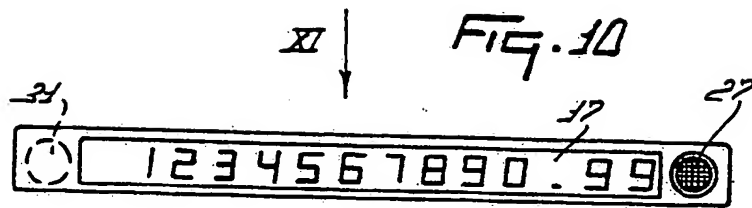


FIG. 4

FIG. 5

FIG. 6









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